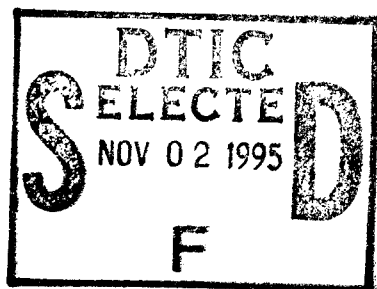


# Computer Science Research in India \*



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## Glossary of Terms

### *Educational Institutions:*

IISc - Indian Institute of Science  
 IIT - Indian Institute of Technology  
 REC - Regional Engineering College  
 UoH - University of Hyderabad  
 UoP - Pune University  
 VRCE - Visweswarayya College of Engineering, Nagpur

### *Government Sponsored Organizations:*

BARC - Bhabha Atomic Research Center  
 CAIR - Center for AI and Robotics  
 CDAC - Center for the Development of Advanced Computation  
 CDOT - Center for the Development of Telematics  
 CMC - Computer Maintenance Corporation  
 ECIL - Electronics Corporation of India, Limited  
 ISI - Indian Statistical Institute  
 ISRO - Indian Space Research Organization  
 MatScience - Inst. for Mathematical Sciences, Madras  
 NAL - National Aerospace Laboratories  
 NCST - National Center for Software Technology  
 NIC - National Informatics Center  
 NRSA - National Remote Sensing Agency  
 TIFR - Tata Institute for Fundamental Research

### *Private Organizations:*

SSF - SPIC Science Foundation, Madras  
 TCS - Tata Consultancy Services  
 TRDDC - Tata Research, Development, and Design Center  
 PSPL - Persistent Systems Private Limited, Pune

### *Professional Organizations:*

CSI - Computer Society of India  
 NASSCOMM - National Association of Software and Service Companies  
 IMA - Indian Manufacturers Association

### *Infrastructure:*

ERNET - Educational and Research Network  
 NICNET - National Informatics Center Network  
 STP - Software Technology Parks  
 VSAT - Very Small Aperture Terminal

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*Government (Funding) Agencies*

AICTE – All India Council for Technical Education

DAE – Department of Atomic Energy

DoE – Department of Electronics

DoS – Department of Space

DST – Department of Science and Technology

MoD – Ministry of Defence

*Conferences:*

COMAD – Conference on the Management of Data

FSTTCS – Foundations of Software Technology and Theoretical Computer Science

IWPP – Intl. Workshop on Parallel Processing

CONSEG – Intl. Conference on Software Engineering Practices

Networks – Conference on Computer Communication Networks

CISMOD – Conference on Information Systems and Management of Data

# 1 Introduction

India prides itself in having one of the largest technical manpower in the world. Her software industry has seen tremendous growth – over 50% each year during the last 10 years – which is the envy of many software exporting countries throughout the world. The students from India's top science and technology educational institutions are highly sought after by research universities in the US and Europe. India is one of just half a dozen countries to have successfully built and deployed their own satellites and launch vehicles.

Given these much-publicized accomplishments, an obvious question is: Has the potential for high-caliber research, indicated by the above facts, been realized? This report addresses this question, in the context of Computer Science. The observations and findings are based on visits to research and educational institutions and discussions with researchers – undertaken during a one-year sabbatical stay in India.

This paper begins with a discussion of the nature of Computer Science Research in India. The type of institutions in which Computer Science research is conducted is considered next followed by a discussion of the students and faculty at the educational institutions. Support for conducting research in the form of equipment, infrastructure, and publications, is the next topic discussed. We then examine how Indian researchers publish their work. Finally we study the influence on Indian Computer Science research of the phenomenal growth in exports by the Indian software industry and the arrival of multinationals since the recent liberalization and globalization of the Indian economy.

Readers interested in knowing more about the research conducted at the Indian Computer Science R&D establishments mentioned in this report should refer to the detailed trip report [5] which complements this summary paper. Additional reading material on Indian Science in general can be found in some of the references listed at the end of this paper.

# 2 Nature of Computer Science Research in India

Computer Science (CS) research in India started in earnest only in the mid-80's triggered by the establishment of post-graduate programs in many institutions throughout the country at that time. Today, almost all areas of computer science research are covered by researchers in India, including topics that are "hot" elsewhere such as multi-media, workflow automation, virtual reality, and hardware-software co-design [5]. The territory covered by Indian researchers is impressive and most of the research problems tackled are of current interest globally. Some of the research has even attracted international attention including work on neuro-fuzzy systems, machine learning, genetic and neural algorithms, the modeling and control of flexible manufacturing systems, speech synthesis, databases, and complexity theory.

One area where solutions unique to Indian conditions have been developed is machine-assisted language processing. With a vast population conversing in a multitude of languages (there are over twenty officially-recognized regional languages!), many with their own scripts, the problem of translation and transliteration from English to these languages and from one Indian language to another is daunting, but one which has the potential for a huge pay-off, – socially, politically, and economically. It is not surprising that many computer

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